Department of Transportation
Federal Aviation Administration
Aircraft Certification Service
Washington, DC

TSO-C170

Effective Date:

Technical Standard Order

PROPOSED

Subject: TSO-C170, HIGH FREQUENCY (HF) RADIO COMMUNICATIONS TRANSCEIVER EQUIPMENT OPERATING WITHIN THE RADIO FREQUENCY RANGE 1.5 TO 30 MEGAHERTZ

1. PURPOSE. This Technical Standard Order (TSO) tells persons seeking a TSO authorization or letter of design approval what minimum performance standards (MPS) their High Frequency (HF) communications transceiver (transmitter/receiver) equipment must first meet in order to obtain approval and be identified with the applicable TSO marking. Title 14 of the Code of Federal Regulations (CFR) part 21 Subpart O prescribes the requirements and rules governing TSO Authorizations. This TSO combines the requirements of the cancelled TSO-C31d, High Frequency Radio Communications Transmitting Equipment Operating Within the Radio Frequency Range of 1.5 to 30 Megahertz and TSO-C32d, High Frequency Radio Communications Receiving Equipment Operating Within the Radio Frequency Range of 1.5 to 30 Megahertz.

2. APPLICABILITY.

a. This TSO is effective for new applications submitted after the effective date of this TSO. All prior revisions to TSO-C31 and TSO-C32 are no longer effective and, in general, applications will not be accepted after the effective date of this TSO. However, applications submitted against the previous versions of TSO-C31 and TSO-C32 may be accepted up to six months after the effective date of this TSO, in cases where we know that the applicant was working against the earlier MPS before this TSO became effective.

b. HF communications equipment approved under a previous TSO authorization may continue to be manufactured under the provisions of their original approval, as specified in 14 CFR § 21.603(b). However, major design changes to HF communications equipment approved under the previous versions of TSO-C31 or TSO-C32 requires a new authorization under this TSO, as provided for in 14 CFR § 21.611(b).

3. REQUIREMENTS. New models of HF communications transceiver equipment that are to be so identified and that are manufactured on or after the effective date of this TSO must meet the MPS set forth in paragraph **2** of this TSO, and RTCA document (RTCA)/DO-163, "Minimum Performance Standards - Airborne High Frequency Radio Communications Transmitting and Receiving Equipment Operating Within the Radio-Frequency Range 1.5 - 30 MHz", dated March 19, 1976, Sections 1 and 2.

a. Functionality. The standards of this TSO apply to equipment intended for aircraft HF communications operating in the radio frequency range of 1.5 MHz to 30 MHz, for Air Traffic Services (ATS) safety communications by playing an integral role with other aircraft equipment used to communicate tactical and strategic information.

b. Failure Condition Classification. Failure of the function defined in paragraphs **3** and **3a** of this TSO has been determined to be a minor failure condition, and the applicant must develop the system to at least the design assurance level commensurate with this failure condition classification.

c. Functional Qualification. The required performance shall be demonstrated under the test conditions specified in RTCA/ DO-163, Appendix A and B.

d. Environmental Qualification. The applicable environmental test procedures are specified in RTCA/DO-160D, "Environmental Conditions and Test Procedures for Airborne Equipment," dated July 29, 1997, including Change 1, dated Dec 14, 2000, Change 2, dated June 12, 2001 and Change 3, dated December 5, 2002. The applicable environmental performance requirements used during the environmental test procedures are specified in RTCA/DO-163, Appendix A and B.

e. Software Qualification. If the article includes software, the software must be developed in accordance with RTCA/DO-178B, "Software Considerations in Airborne Systems and Equipment Certification," dated December 1, 1992.

f. Deviations. The FAA has provisions for using alternative or equivalent means of compliance to the criteria set forth in the MPS of this TSO. Applicants invoking these provisions shall demonstrate that an equivalent level of safety is maintained and shall apply for a deviation per 14 CFR § 21.609.

4. MARKING. In accordance with 14 CFR § 21.607(d), articles manufactured under this TSO must be marked as follows:

a. At least one major component must be permanently and legibly marked with all of the information listed in 14 CFR § 21.607(d), except for the following: the option in 14 CFR § 21.607(d)(2), where the name, type and part number must be used in lieu of the optional model number; and the option in 14 CFR § 21.607(d)(3), where the date of manufacture must be used in lieu of the optional serial number when that information is critical for maintenance and/or inspections.

b. In addition to the requirements of 14 CFR § 21.607(d), each separate component that is easily removable (without hand tools), each interchangeable element, and each separate sub-assembly of the article that the manufacturer determines may be interchangeable must be permanently and legibly marked with at least the name of the manufacturer, manufacturer's subassembly part number, and the TSO number.

c. If the component includes a digital computer, the part number must include hardware and software identification, or a separate part number may be utilized for hardware and software.

Either approach must include a means for showing the modification status. Note that similar software versions, which have been approved to different software levels, must be differentiated by part number.

d. When applicable, identify the equipment as an incomplete system or that the appliance accomplishes additional functions beyond that described in paragraphs **3** and **3a** of this TSO.

e. If any deviations have been granted, place the additional permanent marking, "(Dev)", after the TSO number. Any deviations that have been granted must be described in the installation procedures and limitations section of of this TSO (See paragraph **5.b.)**; however, the component must be marked with the drawing number that provides the installation procedures and limitations.

5. APPLICATION DATA REQUIREMENTS. In accordance with 14 CFR § 21.605(a)(2), the manufacturer must furnish the Manager, Aircraft Certification Office (ACO), Federal Aviation Administration (FAA), responsible for the manufacturer's facilities, one copy each of the following technical data to support the FAA design and production approval:

a. Operating instructions and equipment limitations. The limitations shall be sufficient to describe the operational capability of the equipment. In particular, operational or installation limitations resulting from specific deviations granted must be described in detail.

b. Installation procedures and limitations. The limitations shall be sufficient to ensure that the article, when installed in accordance with the installation procedures, continues to meet the requirements of this TSO. The limitations shall identify any unique aspects of the installation. Finally, the limitations also shall include the following:

(1) A note with the following statement:

> "The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only if performed under 14 CFR Part 43 or the applicable airworthiness requirements."

(2) When applicable, identify the equipment as an incomplete system or that the appliance accomplishes additional functions beyond that described in paragraphs **3** and **3a** of this TSO and describe the functions that are intended to be provided by the appliance.

c. Schematic drawings, as applicable to the installation procedures.

d. Wiring diagrams, as applicable to the installation procedures.

e. List of the components, by part number, that make up the system complying with the standards prescribed in this TSO. Manufacturers should include vendor part number cross-references when applicable.

f. Instructions, in the form of an Installation Manual (IM) and/or Component Maintenance Manual (CMM) containing information on the periodic maintenance, calibration and repair, for the continued airworthiness of installed equipment, including recommended inspection intervals and service life. Details of deviations and limitations, as noted in paragraph **5.a** and **5.b** of this TSO, may also be described in the IM and/or CMM.

g. Equipment specifications.

h. Material and process specifications list.

i. The quality control system description required by 14 CFR §§ 21.605(a)(3) and 21.143(a) including functional test specifications for testing each production article to ensure compliance with this TSO.

j. Manufacturer's TSO qualification test report.

k. Nameplate drawing providing the information required by paragraph **4** of this TSO.

l. A list of all drawings and processes, including revision level, necessary to define the article's design. In the case of a minor change, any revisions to the drawing list need only be made available upon request.

m. An environmental qualifications form as described in RTCA/DO-160D for each component of the system.

n. If the article includes a digital computer: Plan for Software Aspects of Certification (PSAC); Software Configuration Index; and Software Accomplishment Summary. The FAA recommends that the PSAC be submitted early in the software development process. Early submittal will allow timely resolution of issues such as partitioning and determination of software levels.

6. MANUFACTURER DATA REQUIREMENTS. In addition to the data to be furnished directly to the FAA, each manufacturer must have available for review by the manager of the ACO responsible for the manufacturer's facilities the following technical data:

a. The functional qualification specifications to be used to qualify each production article to ensure compliance with this TSO.

b. Equipment calibration procedures.

c. Corrective maintenance procedures within 12 months after TSO authorization.

d. Schematic drawings.

e. Wiring diagrams.

f. The results of the environmental qualification tests conducted in accordance with RTCA/DO-160D.

g. If the article includes a digital computer, the appropriate documentation as defined in RTCA/DO-178B, including all data supporting the applicable objectives found in RTCA/DO-178B, Annex A, Process Objectives and Outputs by Software Level.

7. FURNISHED DATA REQUIREMENTS. One copy of the technical data and information specified in paragraphs **5.a** through **5.f** of this TSO and any other data or information necessary for the proper installation, certification and use for the continued airworthiness of the equipment, must accompany each article or multiple articles, if furnished to one source, i.e., operator, repair station, etc., manufactured under this TSO.

8. AVAILABILITY OF REFERENCED DOCUMENTS.

a. Copies of RTCA/DO-160D (including Changes 1, 2 and 3), RTCA/DO-178B and RTCA/DO-163 may be purchased from the RTCA Inc., 1828 L Street NW, Suite 805, Washington, D.C. 20036-4001. Copies also can be obtained from RTCA Internet website at www.rtca.org.

b. Copies of Federal Aviation Regulations 14 CFR Part 21, Subpart O, may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402-9325. Copies may also be obtained from the Government Printing Office (GPO), electronic CFR Internet website @ www.access.gpo.gov/ecfr/.

c. Advisory Circular (AC) 20-110L [or current revision], "Index of Aviation Technical Standard Orders", and AC 20-115B [or current revision], "RTCA, Inc., Document RTCA/DO-178B" may be obtained from the U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785, telephone (301) 322-4477 or fax (301) 386-5394.

David W. Hempe
Manager, Aircraft Engineering Division
Aircraft Certification Service